QUALITY ASSURANCE PROJECT PLAN
Middlefield-Ellis-Whisman Soil Gas Study
Mountain View, California

Amendment 1

Prepared for:
United States Environmental Protection Agency/Environmental Response Team
Las Vegas, Nevada

By:
Lockheed Martin/Scientific, Engineering, Response and Analytical Service (SERAS)
Work Assignment Number: SERAS-220

Based on the Intergovernmental Data Quality Task Force Uniform
Federal Policy for Quality Assurance Project Plans
(Final Version 1.1, June 2006)

April 28, 2014

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Title and Approval Page

Site Name/Project Name: Middlefield-Ellis-Whisman Soil Gas Study Site
Site Location: Mountain View, California (CA)

Document Title: Quality Assurance Project Plan for Middlefield-Ellis-Whisman Soil Gas Study Site

Lead Organization: Environmental Protection Agency/Environmental Response Team (EPA/ERT)

Preparer's Name and Organizational Affiliation: Yi-Hua Lin, Lockheed Martin/Scientific, Engineering, Response and Analytical Services (SERAS)

Preparer's Address, Telephone Number, and E-mail Address: 4270 S. Maryland Parkway, Las Vegas, Nevada 89119, (609) 865-4477, yi-hua.lin@lmco.com

Preparation Date (Month/Day/Year): April 25, 2014

Investigative Organization's Project Manager/ Date: _____ 4/28/2014
Signature
Printed Name/Organization: David Mickunas/ERT Work Assignment Manager

Investigative Organization's Project QA Officer/Date: _____ 4/29/14
Signature
Printed Name/Organization: Stephen Blaze/ERT Quality Coordinator

Lead Organization's Project Manager/Date: _____ 4/26/2014
Signature
Printed Name/Organization: Yi-Hua Lin/SERAS Task Leader

Approval Signatures/Date: _____ 4/28/14
Signature
Printed Name/Title: Deborah Killeen/SERAS QA/QC Officer

Approval Authority: SERAS

Other Approval Signatures/Date: _____ for 4/28/14
Signature
Printed Name/Title: Patrick Mulrooney /SERAS Acting Program Manager

Document Control Numbering System: SERAS-220-DQAPPA2-042514

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project Name: Middlefield-Ellis-Whisman (MEW) Soil Gas Study Site
Site Location: Mountain View, CA
Site Number/Code: 09MY
Operable Unit:
Contractor Name: Lockheed Martin
Contractor Number: EP-W-09-031

Contract Title: SERAS
Work Assignment Number: SERAS-220

1. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)
2. Identify approval entity: EPA/ERT for Region 9
3. The QAPP is (select one): Generic X Project Specific
4. List dates of scoping sessions that were held: 9/03/2013 and 4/15/2014
5. List dates and titles of QAPP documents written for previous site work, if applicable:

Title	Approval Date
Quality Assurance Project Plan for Middlefield-Ellis-Whisman Soil Gas Study/Scientific, Engineering, Response and Analytical Services (SERAS) – SERAS-220-DQAPP-090913	9/13/14

6. List organizational partners (stakeholders) and connection with lead organization:
   EPA Region 9
7. List data users:
   EPA Region 9
8. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusions below:

   WS #36 – Samples analyzed on-site will not require validation.
   WS #37 – EPA Region 9 will be responsible for assessing the usability of the data

QAPP Worksheet #2
QAPP Identifying Information
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QAPP Worksheet #2
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☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #3
Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
David Mickunas	Work Assignment Manager (WAM)	ERT	(919) 541-4191	(919) 541-0496	mickunas.dave@epamail.epa.gov	SERAS-220-DQAPPA1-042514
Stephen Blaze	Quality Coordinator	ERT	(732) 906-6921	(732) 321-6724	blaze.stephen@epamail.epa.gov	SERAS-220-DQAPPA1-042514
Alana Lee	Remedial Project Manager (RPM)	EPA Region 9	(415) 972-3141	NA	Lee.Alana@epamail.epa.gov	SERAS-220-DQAPPA1-042514
Yi-Hua Lin	Sr. Mass Spectrometer/Mass Spectrometer (MS/MS) Chemist/Task Leader (TL)	SERAS	(702) 784-8036	(702) 784-8189	yi-hua.lin@lmco.com	SERAS-220-DQAPPA1-042514
Deborah Killeen	Quality Assurance/Quality Control (QA/QC) Officer	SERAS	(732) 321-4245	(732) 494-4021	deborah.a.killeen@lmco.com	SERAS-220-DQAPPA1-042514
Patrick Mulrooney	Acting Program Manager	SERAS	(732) 321-4203	(732) 494-4021	patrick.j.mulrooney@lmco.com	SERAS-220-DQAPPA1-042514

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #4
Project Personnel Sign-Off Sheet

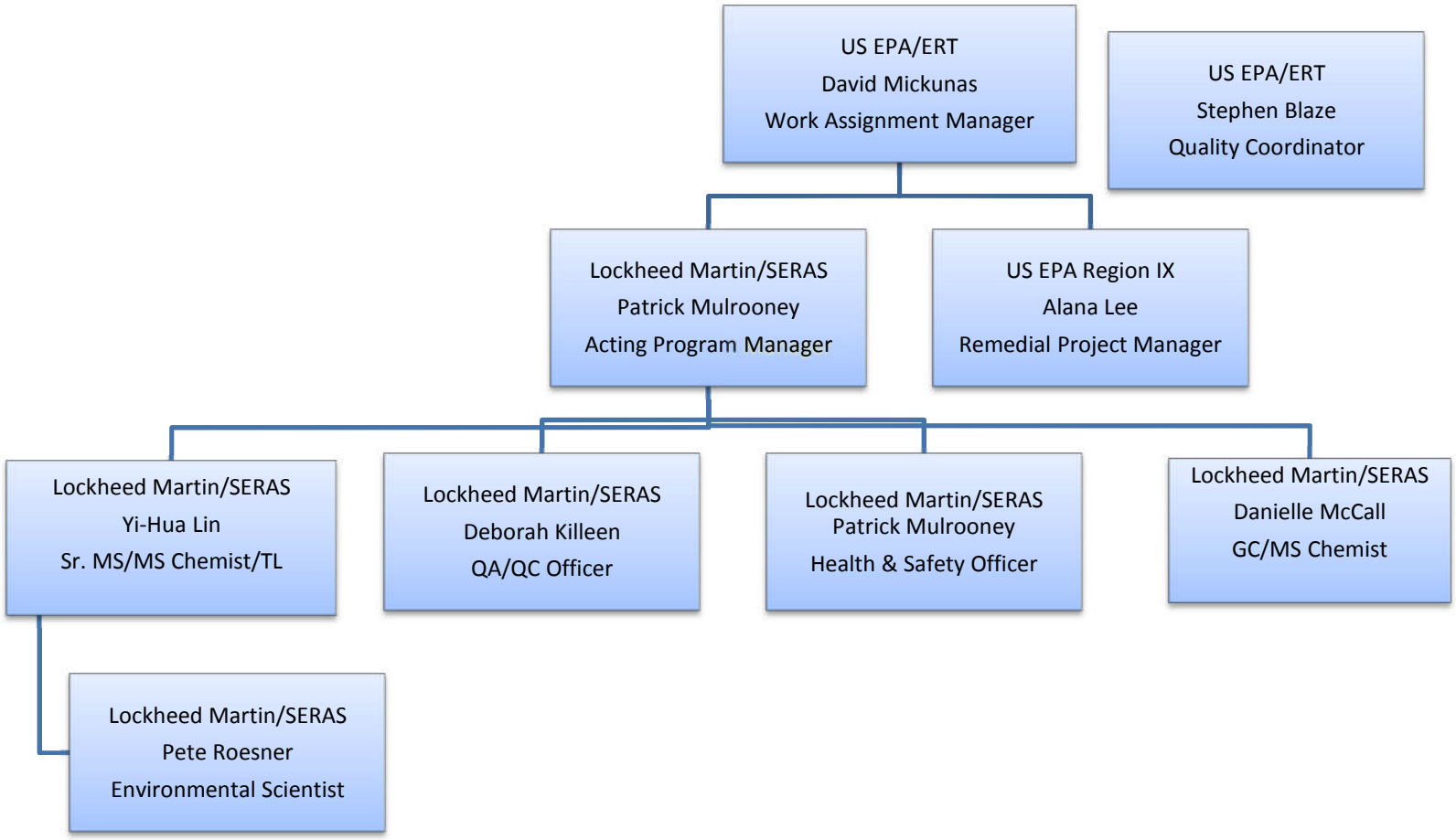
Organization: SERA/ERT/EPA R9

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Yi-Hua Lin	Sr. MS/MS Chemist/TL	(702) 784-8036		4/26/2014
David Mickunas	ERT WAM	(919) 541-4191		4/28/2014
Alana Lee	EPA R9 RPM	~~(303) 312-6963~~ 415 972 3144		4/28/2014
Danielle McCall	Gas Chromatograh/Mass Spectrometer (GC/MS) Chemist	(919) 541-3508		4/28/14
Pete Roesner	SERAS Environmental Scientist	(702) 784-8030	Ken b (Pete) Roesner	4-28-14

Gary Newhart ERT 513.470.8662 Gary Newhart 4-28-14

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #5
Project Organizational Chart



☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #6
Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Approval of initial QAPP and any amendments	ERT WAM ERT Quality Coordinator SERAS Acting Program Manager SERAS QA/QC Officer SERAS TL	David Mickunas Stephen Blaze Patrick Mulrooney Deborah Killeen Yi-Hua Lin	(609) 865-1574 (732) 906-6921 (732) 321-4203 (732) 321-4245 (702) 784-8036	SERAS internal peer review, followed by ERT approval, implementation of changes effective only with approved QAPP or QAPP Change Form.
Nonconformance and Corrective Action	SERAS TL ERT WAM SERAS QA/QC Officer	Yi-Hua Lin David Mickunas Deborah Killeen	(702) 784-8036 (609) 865-1574 (732) 321-4245	Use of the Work Assignment Field Change Form for field issues.
Posting of Deliverables to the ERT Information Management System (IMS) website	SERAS TL SERAS QA/QC Officer SERAS Administrative Support	Yi-Hua Lin Deborah Killeen Eileen Ciambotti	(702) 784-8036 (732) 321-4245 (732) 321-4255	As per work assignment, posting of deliverables to ERT- IMS website constitutes delivery to the WAM.
Work Assignment	SERAS Acting Program Manager	Patrick Mulrooney	(732) 321-4203	Describes scope of work to SERAS personnel from the ERT WAM.
Health and Safety On-Site Meeting	SERAS TL and/or Site Health and Safety Officer	Yi-Hua Lin	(702) 784-8036	Describe potential site hazards, required personal protective equipment, and access to local emergency services.

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #7
Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Yi-Hua Lin	Sr. MS/MS Chemist/TL	SERAS	Project Supervision/Site Health and Safety Officer/Sampling Oversight/GC/MS VOC Analysis	Minimum B.S. degree plus 14 years of related experience/LM Employee Files
Pete Roesner	Environmental Scientist	SERAS	Commercial Driver's License (CDL) Driver/ Probe Installation/Sampling Operations	Minimum B.S. degree plus 3 years of related experience/LM Employee Files
Oleksandr Chubatyy or Gmae Loy	Information Technology/Data Reduction Specialist	SERAS	Floor Plan/ARC-GIS/ Data Reduction	Minimum B.S. degree plus 3 years of related experience/LM Employee Files
Danielle McCall	GC/MS Chemist	SERAS	Trace Atmospheric Gas Analyzer (TAGA) Monitoring	Minimum B.S. degree plus 10 years of related experience/LM Employee Files
Deborah Killeen	QA/QC Officer	SERAS	QA Oversight/Deliverable Review	Minimum B.S. degree plus 14 years of related experience/LM Employee Files
David Mickunas	WAM	EPA/ERT	Technical Direction	EPA job-related qualifications/EPA Files
Stephen Blaze	Quality Coordinator	EPA/ERT	Project Quality Assurance	EPA job-related qualifications/EPA Files
Alana Lee	RPM	EPA R9	Project Oversight	EPA job-related qualifications/EPA Files

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #8
Special Personnel Training Requirements Table

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Project Oversight	Task Leader	Response Engineering and Analytical Contract (REAC)	2002	Yi-Hua Lin	TL/SERAS	Quality Files
Project Oversight/Sampling Operations	Health and Safety 8-hour Refresher	Compliance Solutions	Mar 2014	Yi-Hua Lin	TL/SERAS	Health & Safety Files
Volatile Organic Compound (VOC) Analysis	Demonstration of Capability	SERAS	Apr 2014	Yi-Hua Lin	Sr. MS/MS Chemist/SERAS	Quality Files
	Annual Data Integrity Training/Peak Integration Training		Jan 2014			
Trace Atmospheric Gas Analyzer (TAGA) Monitoring	Health and Safety 8-hour Refresher	Compliance Solutions	Nov 2013	Danielle McCall	GC/MS Chemist/SERAS	Health & Safety Files
	Demonstration of Capability	SERAS	Feb 2013	Danielle McCall	GC/MS Chemist/SERAS	Quality Files
	Annual Data Integrity Training/Peak Integration Training		Jan 2014			
Field Operations	Health and Safety 8-hour Refresher	Compliance Solutions	Mar 2014	Pete Roesner	Environmental Scientist/SERAS	Health & Safety Files
QA Oversight	Uniform Federal Policy for Quality Assurance Project Plans	Advanced Systems	Jan 2006	Deborah Killeen	QA/QC Officer/SERAS	Quality Files
Project Oversight/Sampling Operations	Changes to Environmental Laboratory Accreditation	Advanced Systems	May 2009	Deborah Killeen	QA/QC Officer/SERAS	Quality Files

QAPP Worksheet #8
Special Personnel Training Requirements Table

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
QA Oversight	Lead Auditor Training	IT Corp	Sept 1991	Deborah Killeen	QA/QC Officer/SERAS	Quality Files

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #9-1 (September 2013 Mobilization)
Project Scoping Session Participants Sheet

Project Name: Middlefield-Ellis-Whisman Soil Gas Study Site (WA# SERAS-220) **Projected Date(s) of Sampling:** Week of September 15, 2013 **Project Manager:** David Mickunas	**Site Name:** Middlefield-Ellis-Whisman Soil Gas Study Site **Site Location:** Mountain View, CA

Date of Session: 09/03/14
Scoping Session Purpose: Discuss vapor intrusion mobilization

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Deborah Killeen	QA/QC Officer	SERAS	732-321-4245	Deborah.a.killeen@lmco.com	QA/Validation Oversight
Danielle McCall	GC/MS Chemist	SERAS	919-541-3508	Danielle.l.mccall@lmco.com	Field Chemist
Pete Roesner	Environmental Scientist	SERAS	702-784-0857	Kent.w.roesener@lmco.com	Field Engineer
Yi-Hua Lin	MS/MS Chemist	SERAS	609-865-4477	Yi-hua.lin@lmco.com	Task Leader

Comments/Decisions: Perform analysis of approximately 100 soil gas Tedlar bag samples for tetrachloroethene (PCE) and its breakdown products using the loop injection introduction method on the GC/MS system following the standard operating procedure (SOP) between 9/15/13 and 9/25/13. Data reduction will be performed in the field. The SCRIBE program will be used to log the samples and electronically report the results. Region 9 will install multi-level soil gas wells using a Geoprobe technique and SERAS will install 4-5 foot soil gas wells using a slam bar technique. SERAS personnel will collect samples in 1-liter Tedlar bags and transport to the TAGA laboratory for on-site analysis. Meteorological data will also be collected throughout the event. Weather data are to be provided by the meteorological stations in the area adjacent to the sampling/monitoring.

Action Items: All analytical analyses will be performed on site.

Consensus Decisions: Analysis will be performed by the ERT/SERAS TAGA Laboratory from Las Vegas. Tedlar bags will be provided, prepared, and checked for cleanliness before mobilization on Sunday, 6 April. 2014. Will confirm with WAM what compounds to be reported and the action levels for this project. What action is needed if the concentrations exceed the specified level? Confirm with WAM the number of samples to be collected using the slam bar method.

QAPP Worksheet #9-2 (April 2014 Mobilization)
Project Scoping Session Participants Sheet

Project Name: Middlefield-Ellis-Whisman Soil Gas Study Site (WA# SERAS-220) **Projected Date(s) of Sampling:** Week of April 28, 2014 **Project Manager:** David Mickunas	**Site Name:** Middlefield-Ellis-Whisman Soil Gas Study Site **Site Location:** Mountain View, CA

Date of Session: 04/15/14
Scoping Session Purpose: Discuss vapor intrusion mobilization

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Deborah Killeen	QA/QC Officer	SERAS	732-321-4245	Deborah.a.killeen@lmco.com	QA/Validation Oversight
Danielle McCall	GC/MS Chemist	SERAS	919-541-3508	Danielle.l.mccall@lmco.com	Field Chemist
Pete Roesner	Environmental Scientist	SERAS	702-784-0857	Kent.w.roesener@lmco.com	Field Engineer
Patrick Mulrooney	Acting Project Manager	SERAS	732-321-4203	patrick.j.mulrooney@lmco.com	Project management and H&S oversight
Gary Brown	SERAS/West Group Leader	SERAS	702-784-8041	Gary.s.brown@lmco.com	Task Oversight
David Mickunas	WAM	EPA/ERT	919-541-4191	mickunas.dave@epa.gov	Task Oversight
Yi-Hua Lin	MS/MS Chemist	SERAS	609-865-4477	Yi-hua.lin@lmco.com	Task Leader

Comments/Decisions: Perform analysis of approximately 100 soil gas Tedlar bag samples for tetrachloroethene (PCE) and its breakdown products using the loop injection introduction method on the GC/MS system following the SOP between 4/28/2014 to 5/9/2014. A robot will be utilized to perform TAGA monitoring in some of the tunnels on the facility. Additional sewer sampling will be conducted using vacuum boxes with Tedlar bags. SERAS personnel will prepare sampling equipment, which will be equipped with flashlights, can be dropped in the sewer hole and programmed to start after a one minute or so delay. Sampling will be conducted for approximately one minute. Two public meetings will be held during the trip. Visitors from Korea will be present on Monday 4/28/2014; they will not interfere with our routine activities. Expect one day during the weekend will be a working day. Data reduction will be performed in the field. The SCRIBE program will be used to log the samples and electronically report the results. SERAS personnel will collect samples in 1-liter Tedlar bags and transport to the TAGA laboratory for on-site analysis. Meteorological data will also be collected throughout the event. Weather data are to be provided by meteorological stations closest to the sampling/monitoring locations.

Action Items: All analytical analyses will be performed on site.

Consensus Decisions: Analysis will be performed by the ERT/SERAS TAGA Laboratory from Las Vegas. Fifty Tedlar bags will be purchased, prepared, and checked for cleanliness before mobilization on Saturday, 26 April 2014. TAGA monitoring will focus on PCE, trichloroethene (TCE), and total dichloroethene (DCE). Pete will request an additional 50 sub-slab probe set-ups in the event they are needed. CO_2 cylinders will be delivered on Monday and Pete will coordinate with MEW site personnel and the vendor Praxair.

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #10
Problem Definition

The problem to be addressed by the project: The MEW Site was home to several manufacturing and industrial facilities, including semiconductor and other electronics manufacturing facilities and metal finishing facilities. While in operation, these former facilities required the storage, handling, and use of a variety of chemicals, particularly volatile organic compounds (VOCs). The primary chemicals of concern at the MEW Site are PCE and its degradation products: trichloroethene (TCE) cis-1,2-dichloroethene and vinyl chloride. During operations, some of the chemicals leaked or were otherwise released to the ground, impacting soil and groundwater. In 1981 and 1982, investigations in the area of these facilities indicated that significant levels of contaminants had been released to the soil and groundwater. The primary contaminants of concern are PCE, TCE, and other VOCs in groundwater and the potential migration to indoor air (vapor intrusion pathway).
The environmental questions being asked: Does a subsurface gas plume exist at Middlefield-Ellis-Whisman Soil Gas Study Site? Are VOC contaminants in the soil and groundwater impacting the air within businesses/residences near or adjacent to the Site? If so, do the VOC concentrations exceed the site specific action level established by EPA Region 9? (Refer to Worksheet #15 for action limits)
Observations from any site reconnaissance reports: Not applicable
A synopsis of existing data or information from site reports: Not applicable
The possible classes of contaminants and the affected matrices: VOC contamination of soil and groundwater impacting businesses/residential air.
The rationale for inclusion of chemical and nonchemical analyses: Known PCE, TCE and their byproducts in soil and groundwater contamination.
Information concerning various environmental indicators: Not Applicable
Project decision conditions (“If..., then...” statements): If concentrations of soil gas samples exceed the project action levels in Worksheet #15, then EPA R9 will determine if further sampling needs to be conducted.

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #11 (September 2013 Mobilization)
Project Quality Objectives /Systematic Planning Process Statements

Who will use the data? EPA Region 9
What will the data be used for? Data will be used to assess the potential vapor intrusion of soil and groundwater contamination into indoor air and if so, the potential risk to human health.
What type of data is needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) TAGA monitoring data for TCE, PCE and DCE using on-site mobile laboratory VOC data by GC/MS using an on-site mobile laboratory for soil gas samples for the following 15-compounds: vinyl chloride (VCL), 1,1-DCE, methyl tert-butyl ether (MTBE), trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethane (1,1-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), 1,1,1-trichloroethane (1,1,1-TCA), benzene, TCE, toluene, PCE, ethylbenzene, m&p-xylenes and o-xylene. The chemicals of concern are PCE, TCE and their breakdown products.
How "good" do the data need to be in order to support the environmental decision? On-site GC/MS data – Screening Data using a definitive method TAGA Monitoring Data – Screening Data Meteorological Data – Screening Data
How much data are needed? (number of samples for each analytical group, matrix, and concentration) VOCs – 100 soil gas for low level analysis Stationary monitoring data for 9 units
Where, when, and how should the data be collected/generated? The data for Middlefield-Ellis-Whisman Soil Gas Study Site businesses/residences will be collected during the weeks of September 15, 2013 in accordance with approved monitoring, sampling and analytical SOPs. (Refer to Worksheets #21, #22, & #23)
Who will collect and generate the data? SERAS personnel
How will the data be reported? VOC and TAGA monitoring data will be reported to the WAM on-site. A Final GC/MS Analytical Report and a TAGA Analytical Report will be prepared in accordance with Advanced Air Laboratories standard protocols. A Trip Report will be the final deliverable to the WAM and will be prepared in accordance with SERAS SOP #4017, *Preparation of Trip Reports*. Data will be disseminated to EPA R9 by the WAM.
How will the data be archived? Hard copies of all deliverables will be stored in SERAS Central Files and e-copies will be stored on SERAS Local Area Network (LAN). Data will be imported into a Scribe database and posted to the ERT-IMS website. Data will be archived by SERAS in accordance with Administrative Procedure (AP) #34, *Archiving Data Electronic Files.*

QAPP Worksheet #11 (April 2014 Mobilization)
Project Quality Objectives /Systematic Planning Process Statements

Who will use the data? EPA Region 9
What will the data be used for? Data will be used to assess the potential vapor intrusion of soil and groundwater contamination into indoor air and if so, the potential risk to human health.
What type of data is needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) TAGA monitoring data for TCE, PCE and DCE using on-site mobile laboratory. VOC data by GC/MS using an on-site mobile laboratory for the following 15-compounds: VCL, 1,1-DCE, MTBE, trans-1,2-DCE, 1,1-DCA, cis-1,2-DCE, 1,1,1-TCA, benzene, TCE, toluene, PCE, ethylbenzene, m&p-xylenes and o-xylene for soil gas and sewer gas samples. The chemicals of concern are PCE, TCE and their breakdown products.
How "good" do the data need to be in order to support the environmental decision? On-site GC/MS data – Screening Data using a definitive method TAGA Monitoring Data – Screening Data Meteorological Data – Screening Data
How much data are needed? (number of samples for each analytical group, matrix, and concentration) VOCs – 150 soil gas and sewer gas samples for low level analysis Stationary monitoring data for 9 units
Where, when, and how should the data be collected/generated? The data for Middlefield-Ellis-Whisman Soil Gas Study Site businesses/residences will be collected during the weeks of April 28, 2014 in accordance with approved monitoring, sampling and analytical SOPs. (Refer to Worksheets #21, #22, & #23)
Who will collect and generate the data? SERAS personnel
How will the data be reported? VOC and TAGA monitoring data will be reported to the WAM on-site. A Final GC/MS Analytical Report and a TAGA Analytical Report will be prepared in accordance with Advanced Air Laboratories standard protocols. A Trip Report will be the final deliverable to the WAM and will be prepared in accordance with SERAS SOP #4017, *Preparation of Trip Reports*. Data will be disseminated to EPA R9 by the WAM.
How will the data be archived? Hard copies of all deliverables will be stored in SERAS Central Files and e-copies will be stored on SERAS LAN. Data will be imported into a Scribe database and posted to the ERT-IMS website. Data will be archived by SERAS in accordance with AP #34, *Archiving Data Electronic Files.*

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet 12 (September 2013 and April 2014 Mobilizations)
Measurement Performance Criteria Table

Matrix	Soil Gas (Tedlar® Bag)
Analytical Group	VOA
Concentration Level	Selective Ion Monitoring (SIM)

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
SERAS SOP #2102	SERAS SOP #1741r1.0	Precision	Relative Percent Difference (RPD) ± 25%	Laboratory Duplicates	A
		Accuracy/Bias	±30% Recovery or within control chart limits	Laboratory Control Sample (LCS)	A
		Accuracy/Bias	±40% of mean area response	Internal Standards	A
		Accuracy/Bias Contamination	<RL	Method Blank	A
		Sensitivity	Limit of Detection (LOD) – 7 replicates times the Student's t-factor <RL Limit of Quantitation (LOQ) ±30%	LOD/LOQ Study	A
		Completeness	> 90% Tedlar sampling, > 90% laboratory analysis	Data Completeness Check	S & A

[1]Reference number from QAPP Worksheet #21 (see Section 3.1.2)
[2]Reference number from QAPP Worksheet #23 (see Section 3.2)

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #13
Existing data Criteria and Limitations Table

Existing data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Trip Report	SERAS/Lockheed Martin, SERAS-220-DTR-111213 November 12, 2013	SERAS/Lockheed Martin, sub-slab soil gas and indoor air sample collection September 2013, SERAS Air Toxic Laboratory, sample analysis	To assess the effectiveness of remedial and removal projects at the Site. Data may be used by EPA in the decision making to add new sampling unit locations	Used for site reference and historical monitoring data

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #14 (September 2013 Mobilization)
Summary of Project Tasks

Soil Gas Probe Installation Tasks: Soil gas probes will be installed by SERAS personnel using the slam bar method up to 4-5 feet deep at locations chosen by the WAM or RPM. Probes will be installed in accordance with SERAS SOP #2042, *Soil Gas Sampling.* EPA Region 9 will install multi-level soil gas wells using a Geoprobe technique.
Monitoring Tasks: Prior to any sampling event, SERAS personnel will survey each commercial/industrial unit for lifestyle substances (chemical sources). SERAS personnel will use the TAGA MS/MS to perform indoor air monitoring in real-time for PCE, TCE, and total DCE at selected units. The TAGA will also be used to conduct outdoor ambient air monitoring in the mobile and stationary modes. Monitoring will be performed in accordance with SERAS SOP #1711, *Trace Atmospheric Gas Analyzer (TAGA) IIe.* Real-time preliminary results will be made available to the WAM after each monitoring event.
Sampling Tasks: Soil gas samples will be collected in 1-liter (L) Tedlar® bags at locations designated by the WAM in accordance with SERAS SOP #2102, *Tedlar Bag Sampling*
Analysis Tasks: VOC analysis of all samples collected in Tedlar® bags will be performed on-site in the TAGA mobile laboratory using a GC/MS in accordance with SERAS SOP #1741, *Field Analysis of VOCs in Gaseous Phase Samples by GC/MS Loop Injection.*
Quality Control Tasks: Field QC samples are described in Worksheet #20. Analytical QC samples are outlined in Worksheets #12 and #28.
Existing data: Used for previous site locations and for comparison of data.
Data Management Tasks: All sampling locations will be identified by a field assigned number. Field sampling data will be recorded on field data sheets or in field books. All samples will be delivered under chain of custody (COC) to the on-site laboratory. A Scribe database will be used for data management activities. All deliverables will be generated in accordance to the appropriate SERAS SOP and posted to the ERT-IMS website upon completion. Posting to the ERT-IMS site will be considered as completion of the deliverable.
Documentation and Records: All documentation will be recorded in accordance with SERAS SOP #4001, *Logbook Documentation* and SOP #2002, *Sample Documentation*. Documents and records that may be generated during this project include: Work Plan (WP), QAPP, Health and Safety Plan (HASP), Field Laboratory Logbooks, Site Map, Sample Labels, COC Records, Air Sampling Worksheets, Scribe Database, GC/MS Analytical Report, TAGA Analytical Report, Trip Report, and Field Change Forms, if required.
Assessment/Audit Tasks: No performance audit of field operations is anticipated for this project. The tasks associated with this QAPP are assessed using peer reviews and management system reviews. Peer review enables the chemist to identify and correct reporting errors before reports are submitted. Management system reviews establish compliance with prevailing management structure, policies and procedures, and ensures that the required data are obtained.

Data Review Tasks: All project deliverables will receive an internal peer review prior to release, per guidelines established in the SERAS AP #22, *Peer Review of SERAS Deliverables*.

QAPP Worksheet #14 (April 2014 Mobilization)
Summary of Project Tasks

Sub-Slab soil Gas Probe Installation Tasks: Sub-slab soil gas probes may be installed by SERAS personnel upon the direction of the WAM or RPM. The probes will be installed at locations chosen by the WAM or RPM. They will be installed flush with the slab and capped with a Teflon® coated plug that will be removed during sampling operations. Probes will be installed in accordance with SERAS SOP #2082, *Construction and Installation of Permanent Sub-Slab Soil Gas Wells.*
Monitoring Tasks: Prior to any sampling event, SERAS personnel will survey each commercial/industrial unit for lifestyle substances (chemical sources). SERAS personnel will use the TAGA MS/MS to perform indoor air monitoring in real-time for PCE, TCE, and total DCE at selected units. The TAGA will also be used to conduct outdoor ambient air monitoring in the mobile and stationary modes. Monitoring will be performed in accordance with SERAS SOP #1711, *Trace Atmospheric Gas Analyzer (TAGA) IIe.* Real-time preliminary results will be made available to the WAM after each monitoring event.
Sampling Tasks: Soil gas samples will be collected in 1-L Tedlar® bags at locations designated by the WAM in accordance with SERAS SOP #2102, *Tedlar Bag Sampling*.
Analysis Tasks: VOC analysis of all samples collected in Tedlar® bags will be performed on-site in the TAGA mobile laboratory using a GC/MS in accordance with SERAS SOP #1741r1.0, *Field Analysis of VOCs in Gaseous Phase Samples by GC/MS Loop Injection.*
Quality Control Tasks: Field QC samples are described in Worksheet #20. Analytical QC samples are outlined in Worksheets #12 and #28.
Existing data: Used for previous site locations and for comparison of data.
Data Management Tasks: All sampling locations will be identified by a field assigned number. Field sampling data will be recorded on field data sheets or in field books. All samples will be delivered under chain of custody (COC) to the on-site laboratory. A Scribe database will be used for data management activities. All deliverables will be generated in accordance to the appropriate SERAS SOP and posted to the ERT-IMS website upon completion. Posting to the ERT-IMS site will be considered as completion of the deliverable.
Documentation and Records: All documentation will be recorded in accordance with SERAS SOP #4001, *Logbook Documentation* and SOP #2002, *Sample Documentation*. Documents and records that may be generated during this project include: WP, QAPP, HASP, Field Laboratory Logbooks, Site Map, Sample Labels, COC Records, Air Sampling Worksheets, Scribe Database, GC/MS Analytical Report, TAGA Analytical Report, Trip Report, and Field Change Forms, if required.
Assessment/Audit Tasks: No performance audit of field operations is anticipated for this project. The tasks associated with this QAPP are assessed using peer reviews and management system reviews. Peer review enables the chemist to identify and correct reporting errors before reports are submitted. Management system reviews establish compliance with prevailing management structure, policies and procedures, and ensures that the required data are obtained.
Data Review Tasks: All project deliverables will receive an internal peer review prior to release, per guidelines established in the SERAS AP #22, *Peer Review of SERAS Deliverables*.

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet 15 (September 2013 Mobilization)
Reference Limits and Evaluation Table

Matrix: Soil Gas (Tedlar® Bag)

Analytical Group: VOA

Concentration Level: Low Level SIM

Analyte	CAS Number	Project Action Limit [1] (ppbv)	Project Quantitation Limit (ppbv)	SERAS SOP #1741 Analytical Method		Achievable Laboratory Limits	
				MDLs[2]	Method QLs	MDLs, ppbv[3]	QLs, ppbv
Tetrachloroethene	127-18-4	0.59	0.50	NS	0.50 ppbv	0.378	0.50
Trichloroethene	79-01-6	1.9	0.50	NS	0.50 ppbv	0.119	0.50
1,1-Dichloroethene	75-35-4	530	0.50	NS	0.50 ppbv	0.101	0.50
cis-1,2-Dichloroethene	156-59-2	150	0.50	NS	0.50 ppbv	0.101	0.50
trans-1,2-Dichloroethene	156-60-5	150	0.50	NS	0.50 ppbv	0.137	0.50
Vinyl chloride	75-01-4	0.78	5.0	NS	0.50ppbv	0.224	0.50
Benzene	71-43-2	NS	0.50	NS	0.50 ppbv	0.133	0.50
Toluene	108-88-3	NS	0.50	NS	0.50 ppbv	0.407	0.50
Ethyl Benzene	100-41-4	NS	0.50	NS	0.50 ppbv	0.430	0.50
m,p-xylenes	108-38-3/106-42-3	NS	1.0	NS	1.0 ppbv	0.421	1.0
o-xylene	95-47-6	NS	0.50	NS	0.50 ppbv	0.426	0.50
Methyl tert-Butyl Ether (MTBE)	1634-04-4	NS	0.50	NS	0.50 ppbv	0.193	0.50
1,1-Dichloroethane	75-34-3	4.9	0.50	NS	0.50 ppbv	0.172	0.50
1,1,1-Trichloroethane	71-55-6	NS	0.50	NS	0.50 ppbv	0.181	0.50

[1]Based on ten times the action limits stated in TABLE 3 “Indoor Air Cleanup Levels for Long-term Exposure for the MEW Site - Residential and Commercial Buildings” in the Record of Decision Amendment for the Vapor Intrusion Pathway for Middlefield Ellis Whisman (MEW) Superfund Study Area, Mountain View and Moffett Field, California
[2] Not specified in SERAS SOP #1741
[3] Based on LOD Study for Bus 1554 dated 01/15/2013
ppbv = parts per billion by volume

QAPP Worksheet 15 (April 2014 Mobilization)
Reference Limits and Evaluation Table

Matrix: Soil Gas/Sewer Gas (Tedlar® Bag)

Analytical Group: VOA

Concentration Level: Low Level SIM

Analyte	CAS Number	Project Action Limit [1] (ppbv)	Project Quantitation Limit (ppbv)	SERAS SOP #1741 Analytical Method		Achievable Laboratory Limits	
				MDLs[2]	Method QLs	MDLs, ppbv[3]	QLs, ppbv
Tetrachloroethene	127-18-4	0.59	0.50	NS	0.50 ppbv	0.21	0.50
Trichloroethene	79-01-6	1.9	0.50	NS	0.50 ppbv	0.22	0.50
1,1-Dichloroethene	75-35-4	530	0.50	NS	0.50 ppbv	0.22	0.50
cis-1,2-Dichloroethene	156-59-2	150	0.50	NS	0.50 ppbv	0.27	0.50
trans-1,2-Dichloroethene	156-60-5	150	0.50	NS	0.50 ppbv	0.27	0.50
Vinyl chloride	75-01-4	0.78	5.0	NS	0.50ppbv	0.21	0.50
Benzene	71-43-2	NS	0.50	NS	0.50 ppbv	0.25	0.50
Toluene	108-88-3	NS	0.50	NS	0.50 ppbv	0.09	0.50
Ethyl Benzene	100-41-4	NS	0.50	NS	0.50 ppbv	0.24	0.50
m,p-xylenes	108-38-3/106-42-3	NS	1.0	NS	1.0 ppbv	0.09	1.0
o-xylene	95-47-6	NS	0.50	NS	0.50 ppbv	0.21	0.50
Methyl tert-Butyl Ether (MTBE)	1634-04-4	NS	0.50	NS	0.50 ppbv	0.29	0.50
1,1-Dichloroethane	75-34-3	4.9	0.50	NS	0.50 ppbv	0.30	0.50
1,1,1-Trichloroethane	71-55-6	NS	0.50	NS	0.50 ppbv	0.25	0.50

[1]Based on ten times the action limits stated in TABLE 3 “Indoor Air Cleanup Levels for Long-term Exposure for the MEW Site - Residential and Commercial Buildings” in the Record of Decision Amendment for the Vapor Intrusion Pathway for Middlefield Ellis Whisman (MEW) Superfund Study Area, Mountain View and Moffett Field, California
[2] Not specified in SERAS SOP #1741
[3] Based on LOD Study for Bus 1554 dated 04/16/2014
ppbv = parts per billion by volume

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #16 (September 2013 Mobilization)
Project Schedule Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Installation of soil gas wells	SERAS	9/15/13	9/25/13	No	Not applicable
TAGA Monitoring	SERAS	9/23/13	9/24/13	TAGA Analytical Report	See below
Tedlar Bag Sampling/On-site analysis	SERAS	9/18/13	9/24/13	GC/MS Analytical Report	See below
GC/MS Analytical Report	SERAS	9/26/13	10/3/13	Yes	One week after demobilization. To be delivered as an appendix to the Trip Report.
TAGA Analytical Report	SERAS	9/26/13	10/3/13	Yes	One week after demobilization. To be delivered as an appendix to the Trip Report.
Trip Report	SERAS	10/4/13	10/11/13	Yes	Two weeks after demobilization

QAPP Worksheet #16 (April 2014 Mobilization)
Project Schedule Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
TAGA MS/MS Monitoring	SERAS	4/28/14	4/30/14	Final GC/MS Analytical Report	Not applicable
Tedlar Bag Sampling/On-site analysis	SERAS	5/1/14	5/9/14	Final TAGA Analytical Report	Not applicable
GC/MS Analytical Report	SERAS	5/10/14	5/16/14	Yes	One week after demobilization. To be delivered as an appendix to the Trip Report.
TAGA Analytical Report	SERAS	5/10/14	5/23/14	Yes	Two weeks after demobilization To be delivered as an appendix to the Trip Report
Trip Report	SERAS	10/4/15	10/11/13	Final Trip Report	Three weeks after demobilization

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #17
Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach): EPA Region 9 personnel will determine what properties are sampled based on historical site data and individual access agreements. Sampling will be judgmental (biased). Meteorological parameters will be considered in the transport and dispersion of contaminants.
Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations) [May refer to map or Worksheet #18 for details]. Based on EPA vapor intrusion guidelines, soil gas samples will be collected. Soil gas sampling with Tedlar bags will be conducted in areas with known groundwater contamination in order to delineate a vapor plume and to determine businesses/residences that may be affected. Sewer gas samples will also be collected.

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #18 (September 2013 Mobilization)
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number*	Matrix	Depth (feet)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)**	Sampling SOP Reference[1]	Rationale for Sampling Location[2]
Outdoor Soil Gas (SG)	Soil Gas in Tedlar® Bag	2.2 to 10 feet	VOC	Low Level SIM	109 samples	2102	Judgmental

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #21)
[2]Refer to Worksheet #17

Actual sample locations can be found on the following pages.

SAMPLE LOCATIONS – September 2013 Mobilization

Sample Number	Location	Sample Number	Location	Sample Number	Location
2355	MEW-SG-104-05-091613	2371	MEW-SG-106-05-091713	2398	MEW-SG-113-05-091813
59315	MEW-SG-11-05-091913	2372	MEW-SG-106-10-091713	2399	MEW-SG-44-3.2-091813
2351	MEW-SG-103-05-091613	2375	MEW-SG-108-10-091713	59291	MEW-SG-54-2.8-091813
2352	MEW-SG-103-10-091613	2373	MEW-SG-105-05-091713	59292	MEW-SG-43-2.2-091813
2353	MEW-SG-101-05-091613	2374	MEW-SG-105-10-091713	59293	MEW-SG-45-3.1-091813
2354	MEW-SG-101-10-091613	2379	MEW-SG-04-05-091713	2400	MEW-SG-35-3.3-091813
2356	MEW-SG-104-10-091613	2380	MEW-SG-04-10-091713	59294	MEW-SG-30-3.2-091813
2357	MEW-SG-102-05-091613	2381	MEW-SG-05-05-091713	59295	MEW-SG-55-3.5-091813
2368	MEW-SG105-10-091613	2382	MEW-SG-05-10-091713	59296	MEW-SG-56-3.3-091813
2359	MEW-SG-107-05-091613	2383	MEW-SG-110-05-091813	59297	MEW-SG-31-3.5-091813
2360	MEW-SG-107-10-091613	2384	MEW-SG-111-05-091813	59298	MEW-SG-32-2.9-091813
2361	MEW-SG-106-05-091613	2385	MEW-SG-07-07-091813	59299	MEW-SG-37-2.3-091813
2362	MEW-SG-106-10-091613	2387	MEW-SG-41-3.1-091813	59300	MEW-SG-08-3.2-091813
2363	MEW-SG-109-05-091613	2388	MEW-SG-46-2.5-091813	59301	MEW-SG-50-3.2-091813
2364	MEW-SG-109-10-091613	2389	MEW-SG-38-3.3-091813	59302	MEW-SG-34-2.8-091813
2365	MEW-SG-108-05-091613	2390	MEW-SG-112-05-091813	59303	MEW-SG-51-3.2-091813
2366	MEW-SG-108-10-091613	2392	MEW-SG-114-05-091813	59305	MEW-SG-53-2.8-091813
2369	MEW-SG-108-05-091713	2396	MEW-SG-116-05-091813	59306	MEW-SG-49-3.3-091813

Sample Number	Location	Sample Number	Location	Sample Number	Location
59307	MEW-SG-48-3.5-091813	59327	MEW-SG-118-05-092013	59356	MEW-SG-12-05-09202013
59309	MEW-SG-52-3.0-091813	59328	MEW-SG-119-05-092013	59354	MEW-SG-47-05-09202013
59310	MEW-SG-10-05-091913	59329	MEW-SG-120-05-092013	59358	MEW-SG-14-05-092113
59311	MEW-SG-117-05-091913	59330	MEW-SG-121-05-092013	59359	MEW-SG-15-05-092113

59312	MEW-SG-47-05-091913		59331	MEW-SG-122-05-092013		59360	MEW-SG-16-05-092113
59313	MEW-SG-47-10-091913		59333	MEW-SG-50D-05-092013		59361	MEW-SG-17-05-092113
59314	MEW-SG-11-10-091913		59334	MEW-SG-50D-10-092013		59362	MEW-SG-17-10-092113
59316	MEW-SG-13-05-091913		59335	MEW-SG-53D-05-092013		59363	MEW-SG-06-07-092113
59317	MEW-SG-12-05-091913		59336	MEW-SG-53D-10-092013		59365	MEW-SG-01-10-092113
59318	MEW-SG-12-10-091913		59337	MEW-SG-31D-05-092013		59366	MEW-SG-50D-05-092113
59319	MEW-SG-36-05-091913		59339	MEW-SG-31D-10-092013		59367	MEW-SG-50D-10-092113
59320	MEW-SG-36-10-091913		59343	RES4-SG-01-3.1-09202013		59368	MEW-SG-42D-05-092113
59321	MEW-SG-09-05-091913		59344	RES4-SG-02-3.2-09202013		59369	MEW-SG-42D-10-092113
59322	MEW-SG-09-10-091913		59345	RES4-SG-03-2.9-09202013		59377	MEW-SG-44D-05-092313
59323	MEW-SG-03-05-091913		59332	MEW-SG-44D-05-092013		59378	MEW-SG-17-05-092313
59324	MEW-SG-03-10-091913		59346	RES4-SG-04-3.1-09202013		59382	MEW-SG-53D-10-09242013
59325	MEW-SG-02-05-091913		59349	MEW-SG-40-3.0-09202013		59381	MEW-SG-53D-05-09242013
59326	MEW-SG-02-10-091913		59350	MEW-SG-39-3.4-09202013		59384	MEW-SG-33-3.2-09242013

Sample Number	**Location**
59385	MEW-SG-29-3.1-09242013

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #18 (April 2014 Mobilization)
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number*	Matrix	Depth (feet)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)**	Sampling SOP Reference[1]	Rationale for Sampling Location[2]
TBD	Soil Gas in Tedlar® Bag	4-5 feet	VOC	Low Level SIM	TBD	2102	Judgmental
TBD	Sewer Gas in Tedlar Bag	~10 feet	VOC	Low Level SIM	TBD	2102	Judgmental

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #21)
[2]Refer to Worksheet #17
* Sampling locations will be determined by RPM and WAM
**Locations of field duplicates will be determined once on-site.
TBD = To be determined

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil Gas Sewer Gas	VOA	Low Level SIM	SERAS SOP #1741	1-L	1-L Tedlar® Bag	Place in dark plastic bag	24 Hours

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #20 (September 2013 Mobilization)
Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference[1]	No. of Sampling Locations	No. of Field Duplicate Pairs	Inorganic No. of MS	No. of Trip Blanks	No. of Equip. Blanks	No. of PT Samples	Total No. of Samples to Lab
Soil Gas	VOC	Low Level SIM	SERAS SOP #1741	100	NA	NA	NA	NA	NA	100

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23)
NA = Not applicable

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #20 (April 2014 Mobilization)
Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference[1]	No. of Sampling Locations	No. of Field Duplicate Pairs	Inorganic No. of MS	No. of Trip Blanks	No. of Equip. Blanks	No. of PT Samples	Total No. of Samples to Lab
Soil Gas Sewer Gas	VOC	Low Level SIM	SERAS SOP #1741	Up to150	NA	NA	NA	NA	NA	Up to 150

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23)
NA = Not applicable
TBD = To be determined

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #21 (September 2013 Mobilization)
Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Check if yes)	Comments
2042	Soil Gas Sampling	SERAS	Slam Bar		
2002	Sample Documentation	SERAS	NA		
2005	Quality Assurance/Quality Control Samples	SERAS	NA		
2102	Tedlar Bag Sampling	SERAS	1-L Tedlar Bag		
4005	Chain of Custody Procedures	SERAS	NA		

NA = Not applicable

QAPP Worksheet #21 (April 2014 Mobilization)
Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Check if yes)	Comments
2082	Construction an Installation of Permanent Sub-Slab Soil Gas Wells	SERAS	Probes		
2002	Sample Documentation	SERAS	NA		
2005	Quality Assurance/Quality Control Samples	SERAS	NA		
2102	Tedlar Bag Sampling	SERAS	1-L Tedlar Bag		
4005	Chain of Custody Procedures	SERAS	NA		

NA = Not applicable

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Electronic Flow Meter	Calibrated by manufacturer	NA	NA	NA	Annual	Manufacturer's Specifications	Recalibrate	Manufacturer or designated vendor	Manufacturer's Operating Guide
Mass Flow Controller	Calibrated by operator	NA	Calibration Monitoring	Proper flow being achieved	Daily or when needed	Within 5% of reference standard throughout the range	Recalibrate	Operator	1711
TAGA MS/MS¥	Minimum six point calibration for all target compounds	Check gas and standard supply daily, optimize tuning parameters, adjust peak widths, and ensure correct mass assignments	VOC Analysis	Ion source, first quadrupole rods, check needle valve, tighten Swagelok ¼" nuts to injection port	Minimum one to two standard calibrations per monitoring day.	Correlation coefficient (r) of each ion pair is greater than or equal to 0.90	Inspect system for problems; perform maintenance (i.e. source and rod cleaning, etc.). Re-tune and rerun calibration	Analyst	1711
Dwyer Rotometer	Calibrated by manufacturer	NA	NA	NA	Annual	Manufacturer's Specifications	Recalibrate	Manufacturer or designated vendor	Manufacturer's Operating Guide
Gilibrator calibration bubble meter	Calibrated by manufacturer	NA	NA	NA	Annual	Manufacturer's Specifications	Recalibrate	Manufacturer or designated vendor	Manufacturer's Operating Guide

[1]Specify the appropriate reference letter or number from the Project Sampling SOP References table (Worksheet #21 and #23).
NA = Not applicable
¥ See TAGA QA/QC Protocol Table below.

QA/QC Protocols for TAGA Monitoring (SOP #1711)

Instrument	Procedure	Frequency	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
TAGA MS/MS	Calibrate sample air flow (SAF)	First day of monitoring activities	1200 to 1500 mL/sec based on environmental conditions	Adjust span on MKS box	Analyst	1711
TAGA MS/MS	Calibrate mass flow controller (MFC)	First day of monitoring activities	The maximum flow rate should be adjusted to be within 2% of desired flow. After ten readings for each of three flows, maximum error should be below ±5%.	Adjust span on MKS box	Analyst	1711
TAGA MS/MS	Standard calibration	Beginning (BOD) and end (EOD) of each monitoring day. Depending on environmental and instrumentation factors, calibrations may be repeated prior to any monitoring survey.	Correlation coefficient (r) of each ion pair is greater than or equal to 0.90	Inspect system for problems; re-tune, perform maintenance (i.e. ion source cleaning, rod cleaning, etc.). Rerun calibration	Analyst	1711
TAGA MS/MS	Transport Efficiency	Beginning and end of each monitoring day	85% efficiency	Inspect Teflon® hose for leaks or kinks	Analyst/Field personnel	1711

QA/QC Protocols for TAGA Monitoring (SOP #1711)

Instrument	Procedure	Frequency	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
TAGA MS/MS	Response Factor (RF)/Intermediate Response Factor (IRF)	Calculated from each calibration for each ion pair	IRF is calculated between a pair of calibrations. A percent difference (%D) of the compound's RF is calculated between pairs of calibrations. If %D is greater than 25%, the IRF must be used to quantify the target compound.	Not applicable	Analyst	1711
TAGA MS/MS	Detection and Quantitation Limits	Start of each monitoring day	Project specific, calculated using initial ambient air data segment collected at the beginning of BOD calibration and the RF or IRF	Inspect system for problems; re-tune, perform maintenance (i.e. ion source cleaning, rod cleaning, etc.). Rerun calibration	Analyst	1711
TAGA MS/MS	30 mL spike	One minute data segment collected at end of each monitoring survey	It's equivalent concentration in ppbv (approximately 7 ppbv)	Inspect system for problems; re-tune, perform maintenance (i.e. ion source cleaning, rod cleaning, etc.). Rerun calibration	Analyst	1711

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #23 (September 2013 Mobilization)
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
1711	Trace Atmospheric Gas Analyzer (TAGA) IIE Operation, Rev. 0.0 10/22/2012	Screening	VOA	TAGA MS/MS	ERT/SERAS Mobile Laboratory	☐
1741	Field Analysis of VOCs in Gaseous Phase Samples by GC/MS Loop Injection, Rev. 0.0 10/02/2012	Definitive	VOA	GC/MS	ERT/SERAS Mobile Laboratory	☐

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #23 (April 2014 Mobilization)
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
1711	Trace Atmospheric Gas Analyzer (TAGA) IIE Operation, Rev. 0.0 10/22/2012	Screening	VOA	TAGA MS/MS	ERT/SERAS Mobile Laboratory	☐
1741	Field Analysis of VOCs in Gaseous Phase Samples by GC/MS Loop Injection, Rev. 1.0 02/03/2014	Definitive	VOA	GC/MS	ERT/SERAS Mobile Laboratory	☐

☐ Worksheet Not Applicable (State Reason)

QQAPP Worksheet #24 (September 2013 Mobilization)
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
GC/MS	Initial calibration (IC), minimum 5-points for all analytes	Initially prior to sample analysis. After changes to instrument and when instrument does not meet method criteria.	Relative standard deviation (RSD) ≤ 30%,	Inspect system for problems; perform maintenance (i.e. ion source cleaning, column replacement, etc.), check calibration standards. Rerun IC, reanalyze affected samples	Analyst	SERAS SOP #1741
GC/MS	Initial Calibration Verification (ICV)	Immediately following an initial calibration	Percent recovery (%R) ±30%	Rerun ICV. If needed, inspect system for problems, perform maintenance (i.e. ion source cleaning, column replacement, etc.), rerun IC	Analyst	SERAS SOP #1741
GC/MS	Daily Continuing Calibration Check (CCC)	Every 24 hours	Percent difference (%D) ±30%	Rerun CCC. If needed, inspect system for problems, perform maintenance (i.e. ion source cleaning, column replacement, etc.), rerun IC	Analyst	SERAS SOP #1741

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23)

QQAPP Worksheet #24 (April 2014 Mobilization)
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
GC/MS	Initial calibration (IC), minimum 5-points for all analytes	Initially prior to sample analysis. After changes to instrument and when instrument does not meet method criteria.	Relative standard deviation (RSD) ≤ 30%,	Inspect system for problems; perform maintenance (i.e. ion source cleaning, column replacement, etc.), check calibration standards. Rerun IC, reanalyze affected samples	Analyst	SERAS SOP #1741
GC/MS	Initial Calibration Verification (ICV)	Immediately following an initial calibration	Percent recovery (%R) ±30%	Rerun ICV. If needed, inspect system for problems, perform maintenance (i.e. ion source cleaning, column replacement, etc.), rerun IC	Analyst	SERAS SOP #1741
GC/MS	Daily Continuing Calibration Check (CCC)	Every 24 hours	Percent difference (%D) ±30%	Rerun CCC. If needed, inspect system for problems, perform maintenance (i.e. ion source cleaning, column replacement, etc.), rerun IC	Analyst	SERAS SOP #1741
GC/MS	Daily Low Level Continuing Calibration Check (LLCCV)	Every 24 hours	Percent difference (%D) ±50%	Rerun CCC. If needed, inspect system for problems, perform maintenance (i.e. ion source cleaning, column replacement, etc.), rerun IC	Analyst	SERAS SOP #1741

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23)

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #25 (September 2013 and April 2014 Mobilizations)
Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
GC/MS	Check gas supply daily, bake or change trap as needed, manual tune if 4-Bromofluorobenzene (BFB) not within criteria, cut or change column, change septum as needed.	VOC Analysis	Check ion source, gas supply, septum seal, vacuum, trap	Prior to sample analysis or when instrument does not meet criteria	BFB criteria achieved, Relative standard deviation (RSD) ≤ 30%	Recalibrate and/or perform necessary instrument maintenance, check calibration standards, re-analyze affected samples.	Analyst	SERAS SOP #1741

[1]Specify the appropriate reference letter or number from Analytical SOP References table (Worksheet #23)

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #26 (September 2013 and April 2014 Mobilizations)
Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Pete Roesner, SERAS Environmental Scientist
Sample Packaging (Personnel/Organization): NA
Coordination of Shipment (Personnel/Organization): NA
Type of Shipment/Carrier: NA
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Yihua Lin, SERAS Sr. MS/MS Chemist
Sample Custody and Storage (Personnel/Organization): Pete Roesner, SERAS Environmental Scientist, Yihua Lin, SERAS Sr. MS/MS Chemist
Sample Preparation (Personnel/Organization): NA
Sample Determinative Analysis (Personnel/Organization): Yi-Hua Lin, SERAS Sr. MS/MS Chemist
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Samples will be consumed within 24 hours of collection
Sample Extract/Digestate Storage (No. of days from extraction/digestion): NA
Biological Sample Storage (No. of days from sample collection): NA
SAMPLE DISPOSAL
Personnel/Organization: NA
Number of Days from Analysis: NA

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #27 (September 2013 and April 2014 Mobilizations)
Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): Each Tedlar bag will be affixed with a label identifying the sample number, sample location, collection date, collection time, matrix, and requested analysis. Samples collected in Tedlar bags will be delivered under COC to the mobile laboratory for on-site analysis. Scribe will be used for sample management, as well as, generation of sample documentation, such as, labels and COC records. All COC records will receive a peer review in the field and prior to relinquishment in accordance with SERAS SOP # 4005, *Chain of Custody Procedures.* The samples collected by SERAS personnel will be relinquished under the COC to the SERAS Personnel for on-site VOC analysis. Procedures outlined in SERAS SOP #2002 will be applied (refer to Worksheet #21).
Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal): No samples will be archived at the laboratory.
Sample Identification Procedures: Each sample will be identified with a unique identification number at the time of collection, and unique laboratory identification will be assigned to each sample during on-site analysis at the Mobile Laboratory. Procedures outlined in SERAS SOP #2002 will be applied (refer to Worksheet #21).
Chain-of-custody Procedures: Chain-of-custody records will be generated for all samples submitted for analysis using Scribe database software. Procedures outlined in SERAS SOP #4005, *Chain of Custody Procedures* will be applied.

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #28 (September 2013 Mobilization)
QC Samples Table

Matrix	Soil Gas (Tedlar® Bag)
Analytical Group	VOA
Concentration Level	SIM
Sampling SOP	2102
Analytical Method/ SOP Reference	1741
Sampler's Name	Pete Roesner
Field Sampling Organization	SERAS
Analytical Organization	ERT/SERAS Mobile Laboratory
No. of Sample Locations	100

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standard	Each sample	±40% of daily calibration IS response	Re-analyze sample	Analyst	Precision/Accuracy /Bias	±40% of daily calibration IS response
Continuing Calibration	Every 24 hours	± 30% D	Clean, repair, re-analyze	Analyst	Accuracy	± 30% D
LCS	5% of samples	± 30% R	Clean, repair, re-analyze	Analyst	Accuracy/Bias	± 30% R
Method Blank	1/24-hour clock	< Reporting Limit	Clean, repair, re-analyze	Analyst	Accuracy/Bias Contamination	< Reporting Limit

QAPP Worksheet #28 (September 2013 Mobilization)
QC Samples Table

Matrix	Soil Gas (Tedlar® Bag)
Analytical Group	VOA
Concentration Level	SIM
Sampling SOP	2102
Analytical Method/ SOP Reference	1741
Sampler's Name	Pete Roesner
Field Sampling Organization	SERAS
Analytical Organization	ERT/SERAS Mobile Laboratory
No. of Sample Locations	100

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LOD/LOQ Study	Annual	LOD < Reporting Limit LOQ ±30% or within control chart limits	Clean, repair, re-analyze.	Analyst	Sensitivity	LOD < Reporting Limit LOQ ±30% or within control chart limits
Lab Replicates	1 per sampling day	RPD ±25%	Reanalyze and/or flag data	Analyst	Precision	RPD ±25%

NA = Not applicable

QAPP Worksheet #28 (April 2014 Mobilization)
QC Samples Table

Matrix	Soil Gas Sewer Gas (Tedlar® Bag)
Analytical Group	VOA
Concentration Level	SIM
Sampling SOP	2102
Analytical Method/ SOP Reference	1741r1.0
Sampler's Name	Pete Roesner
Field Sampling Organization	SERAS
Analytical Organization	ERT/SERAS Mobile Laboratory
No. of Sample Locations	~150

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standard	Each sample	±40% of daily calibration IS response	Re-analyze sample	Analyst	Precision/Accuracy /Bias	±40% of daily calibration IS response
Continuing Calibration	Every 24 hours	± 30% D	Clean, repair, re-analyze	Analyst	Accuracy	± 30% D
Low Level Continuing Calibration	Every 24 hours	± 50% D	Clean, repair, re-analyze	Analyst	Accuracy	± 50% D
LCS	5% of samples	± 30% R	Clean, repair, re-analyze	Analyst	Accuracy/Bias	± 30% R
Method Blank	1/24-hour clock	< Reporting Limit	Clean, repair, re-analyze	Analyst	Accuracy/Bias Contamination	< Reporting Limit

QAPP Worksheet #28 (April 2014 Mobilization)
QC Samples Table

Matrix	Soil Gas Sewer Gas (Tedlar® Bag)
Analytical Group	VOA
Concentration Level	SIM
Sampling SOP	2102
Analytical Method/ SOP Reference	1741r1.0
Sampler's Name	Pete Roesner
Field Sampling Organization	SERAS
Analytical Organization	ERT/SERAS Mobile Laboratory
No. of Sample Locations	~150

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LOD/LOQ Study	Annual	LOD < Reporting Limit LOQ ±30% or within control chart limits	Clean, repair, re-analyze.	Analyst	Sensitivity	LOD < Reporting Limit LOQ ±30% or within control chart limits
Lab Replicates	1 per sampling day	RPD ±25%	Reanalyze and/or flag data	Analyst	Precision	RPD ±25%

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #29
Project Documents and Records Table

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Chain of custody records Sample Labels Tedlar Sampling Worksheets Field Change Form (if necessary)	Instrument Run Logs Preventive Maintenance Logs Instrument Printouts Analytical Results	NA	NA	GC/MS Analytical Report Trip Report Scribe Database Final TAGA Analytical Report

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number
Soil Gas/ Sewer Gas	VOC	Low	Refer to WS #18	SERAS SOP #1741	1 week after demobilization	ERT/SERAS Mobile Laboratory 4270 South Maryland Parkway, Bldg E, Suite 900 Las Vegas, Nevada 89119	NA

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #31
Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Laboratory Accreditation Audit	Every 2 years	External	NJDEP	NELAP Accreditation Agency	Deborah Killeen, QA/QC Officer, ERT/SERAS Laboratory	Yi-Hua Lin, Sr. MS/MS Chemist, ERT/SERAS Mobile Laboratory (Vegas Office)	NELAP Accreditation Agency
Performance Evaluation Sample	Annual	External	PT Provider	Vendor-Scored	Deborah Killeen, ERT/SERAS Laboratory QA/QC Officer	Yi-Hua Lin, Sr. MS/MS Chemist, ERT/SERAS Mobile Laboratory (Vegas Office)	Deborah Killeen, QA/QC Officer, ERT/SERAS Laboratory
Mobile Laboratory Audit	Annual	Internal	SERAS	Deborah Killeen, QA/QC Officer, ERT/SERAS Laboratory	Yi-Hua Lin, Sr. MS/MS Chemist, ERT/SERAS Mobile Laboratory (Vegas Office)	Yi-Hua Lin, Sr. MS/MS Chemist, ERT/SERAS Mobile Laboratory (Vegas Office)	Deborah Killeen, ERT/SERAS Laboratory, QA/QC Officer

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Field Observations/ Deviations from Work Plan	Logbook	Yi-Hua Lin /TL/SERAS	Immediately	Field Change Form	Yi-Hua Lin /TL, SERAS	Within 24 hours of change
Lab Performance Audits	Audit report	Deborah Killeen, SERAS QA/QC Officer	Within 30 days	Corrective Action Plan	NELAP Accreditation Agency	Within 30 days
Peer Review	In the deliverable	Yi-Hua Lin /TL/SERAS	Prior to deliverable due date	Comments directly in the deliverable	Yi-Hua Lin /TL SERAS	Prior to deliverable due date
Internal Lab Performance Audits	Audit report	Yi-Hua Lin Sr. MS/MS Chemist/SERAS	Within 45 days	Corrective Action Plan	Deborah Killeen, QA/QC Officer, SERAS	Within 45 days

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #33
QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Technical Report	Monthly	20th of the month following performance period	TL/SERAS	ERT Project Officer and WAM
QA Report	Quarterly	February, May, August, November	QA/QC Officer/SERAS	ERT Project Officer and Quality Coordinator

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #34
Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Chain of Custody Record	Reviewed by Field Sampling Personnel in field and prior to final analytical report preparation	Internal	SERAS Field Chemists SERAS TL
Final TAGA and GC/MS Analytical Reports	Reviewed for accuracy	Internal	Peer Review Team
Trip Report	Reviewed for accuracy	Internal	Peer Review Team
Completeness Check	Review of Planning Documents, Analytical Data package, Sampling Documents and External Reports, as applicable, using the UFP-QAPP Checklist	Internal	SERAS TL

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	SOPs	Ensure that the sampling methods/procedures outlined in the QAPP were followed and any deviations noted	SERAS TL, WAM
IIa	COC Records	Examine COC records and match with requested analyses.	SERAS Sr. MS/MS Chemist/TL Peer Review Team
IIa	Lab Data Package	Examine packages against COC records (holding times, sample handling, methods, sample identifications, qualifiers).	SERAS Sr. MS/MS Chemist/TL Peer Review Team

☑ Worksheet Not Applicable (State Reason) Data will be verified but not validated.

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)

X Worksheet Not Applicable (State Reason)

EPA Region 9 will be responsible for assessing the usability of the data.

QAPP Worksheet #37
Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:
Describe the evaluative procedures used to assess overall measurement error associated with the project:
Identify the personnel responsible for performing the usability assessment: Region 9
Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies: